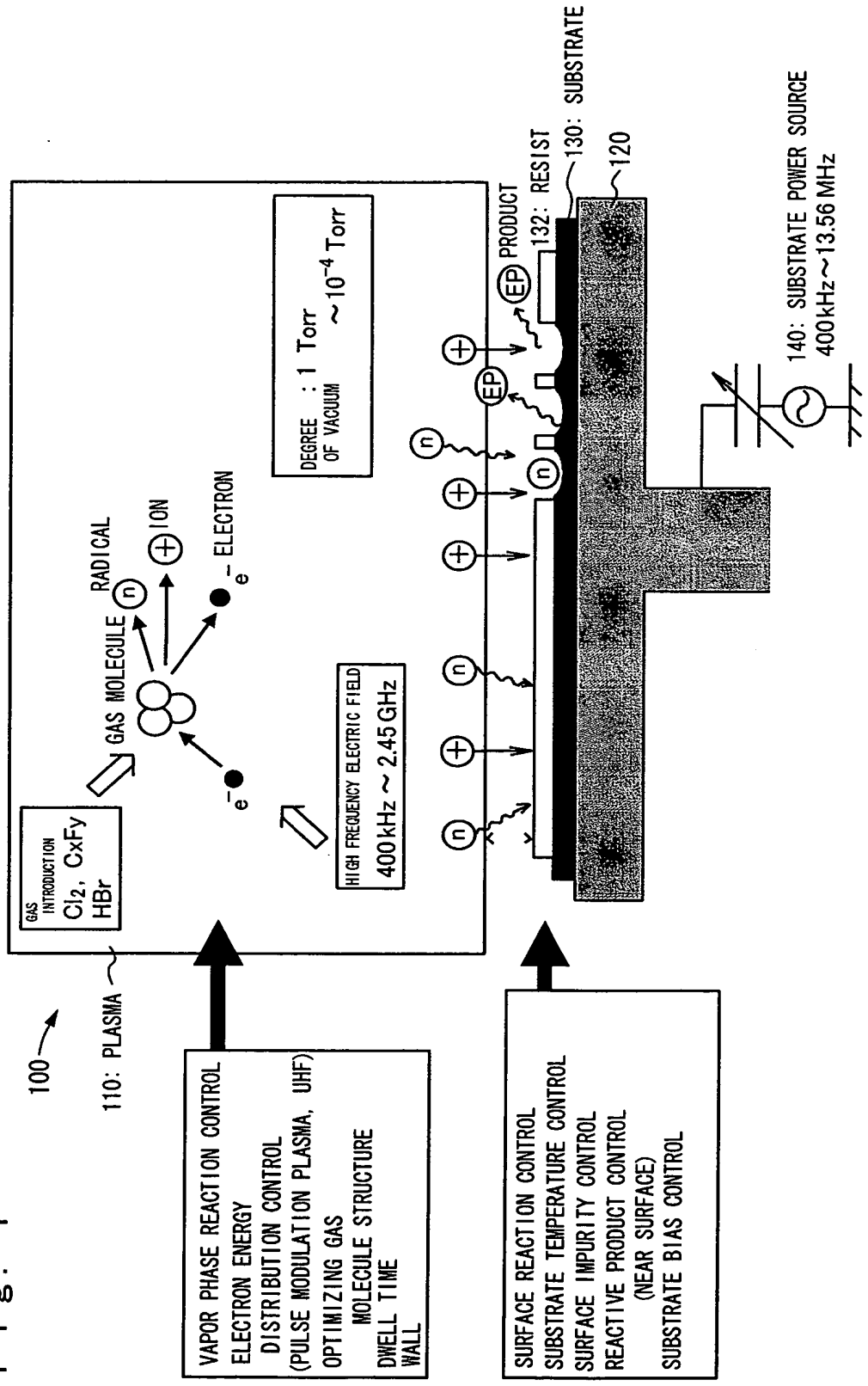
Fig. 1


100
110: PLASMA
GAS INTRODUCTION
Cl2, CxFy
HBr
GAS MOLECULE
RADICAL
ION
ELECTRON
HIGH FREQUENCY ELECTRIC FIELD
400kHz ~ 2.45GHz
DEGREE OF VACUUM : 1 Torr ~10-4 Torr
PRODUCT
132: RESIST
130: SUBSTRATE
120
140: SUBSTRATE POWER SOURCE
400kHz~13.56 MHz
VAPOR PHASE REACTION CONTROL
ELECTRON ENERGY
DISTRIBUTION CONTROL
(PULSE MODULATION PLASMA, UHF)
OPTIMIZING GAS
MOLECULE STRUCTURE
DWELL TIME
WALL
SURFACE REACTION CONTROL
SUBSTRATE TEMPERATURE CONTROL
SURFACE IMPURITY CONTROL
REACTIVE PRODUCT CONTROL
(NEAR SURFACE)
SUBSTRATE BIAS CONTROL

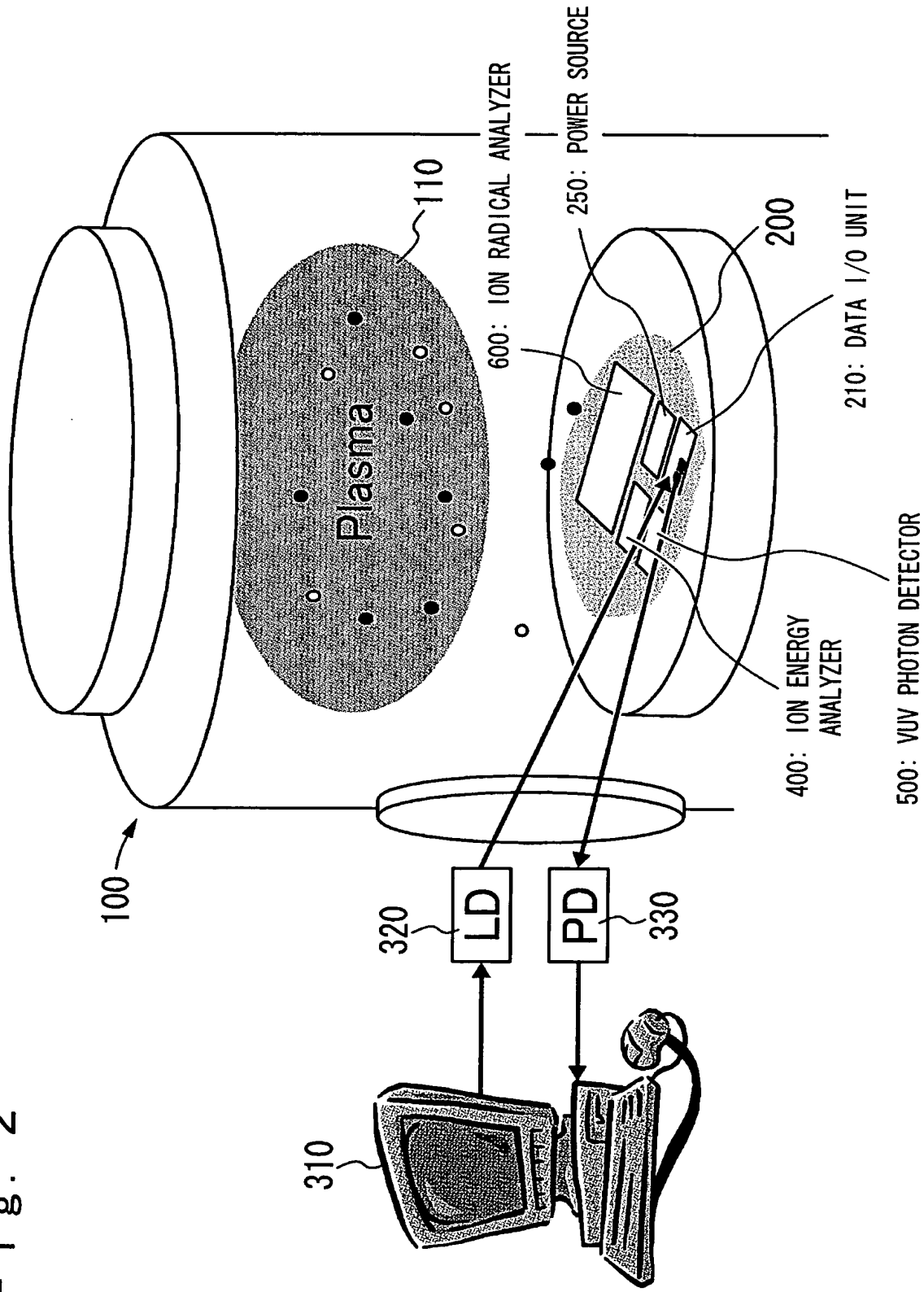

100
110
Plasma
600: ION RADICAL ANALYZER
250: POWER SOURCE
200
210: DATA I/O UNIT
400: ION ENERGY ANALYZER
500: VUV PHOTON DETECTOR
320
LD
PD
330
310

Fig. 2

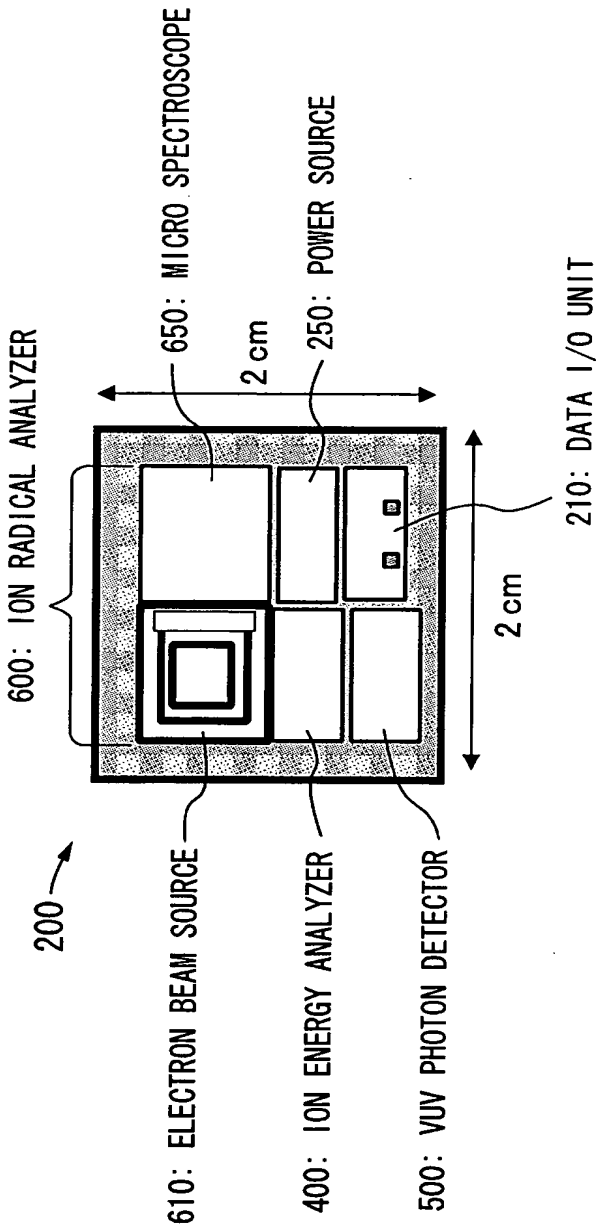

600: ION RADICAL ANALYZER
650: MICRO SPECTROSCOPE
2 cm
250: POWER SOURCE
210: DATA I/O UNIT
2 cm
200
610: ELECTRON BEAM SOURCE
400: ION ENERGY ANALYZER
500: VUV PHOTON DETECTOR

Fig. 3

Fig. 4

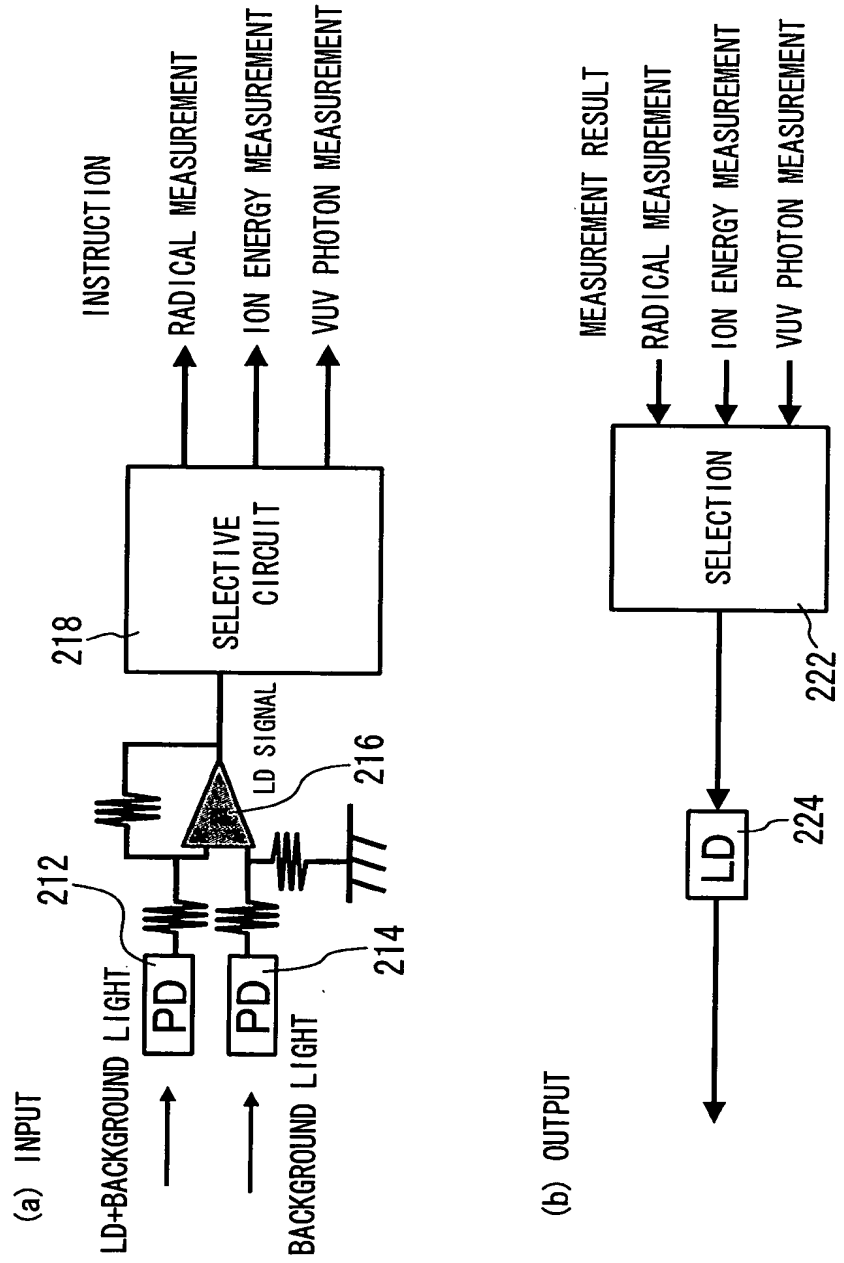

(a) INPUT
LD+BACKGROUND LIGHT
BACKGROUND LIGHT
PD
PD
212
214
216
LD SIGNAL
218
SELECTIVE CIRCUIT
INSTRUCTION
RADICAL MEASUREMENT
ION ENERGY MEASUREMENT
VUV PHOTON MEASUREMENT
(b) OUTPUT
MEASUREMENT RESULT
RADICAL MEASUREMENT
ION ENERGY MEASUREMENT
VUV PHOTON MEASUREMENT
SELECTION
222
LD
224

Fig. 5

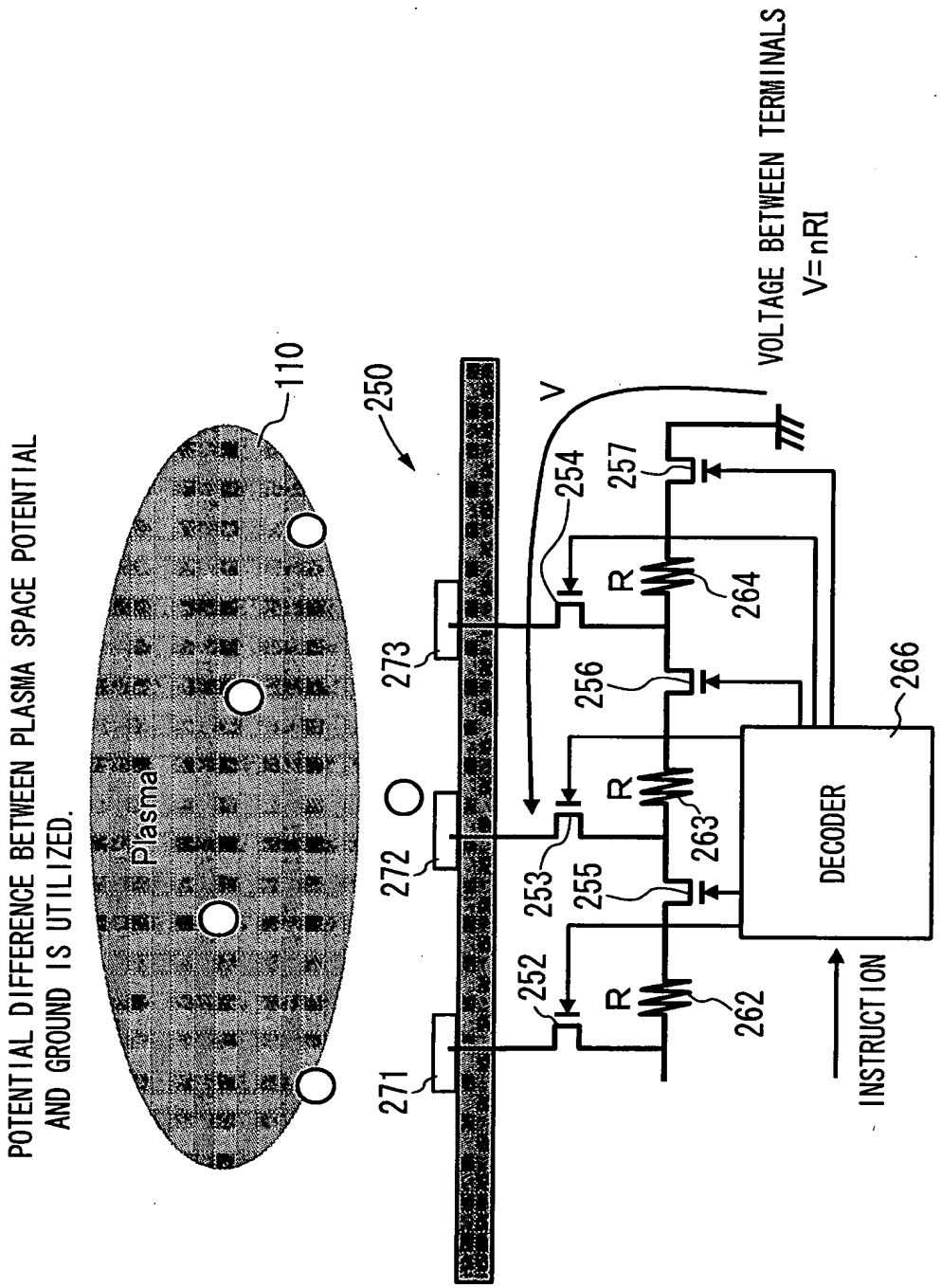

POTENTIAL DIFFERENCE BETWEEN PLASMA SPACE POTENTIAL AND GROUND IS UTILIZED.
Plasma
110
250
271
272
273
252
253
254
255
256
257
262
263
264
R
V
VOLTAGE BETWEEN TERMINALS
V=nRI
DECODER
266
INSTRUCTION

Fig. 6

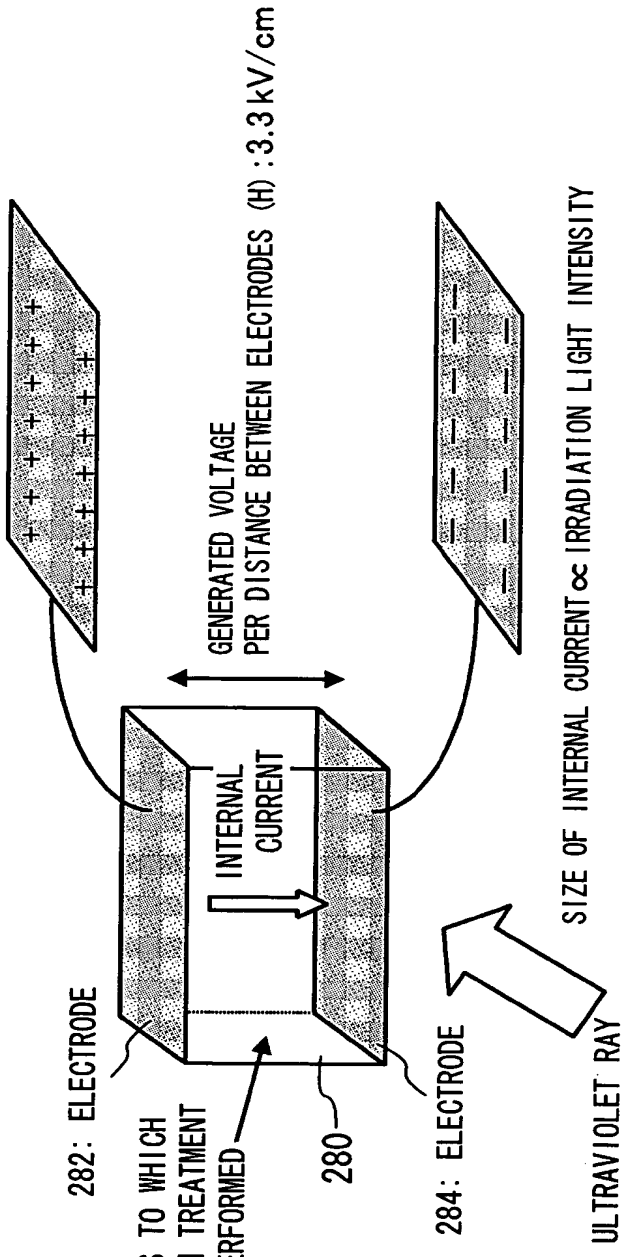

GENERATED VOLTAGE
PER DISTANCE BETWEEN ELECTRODES (H) :3.3 kV/cm
INTERNAL
CURRENT
282: ELECTRODE
PLZT CERAMICS TO WHICH
POLARIZATION TREATMENT
HAS BEEN PERFORMED
280
284: ELECTRODE
SIZE OF INTERNAL CURRENT ∝ IRRADIATION LIGHT INTENSITY
ULTRAVIOLET RAY
UP TO 365nm

Fig. 7

STRUCTURE OF ON-WAFER ION ENERGY ANALYZER

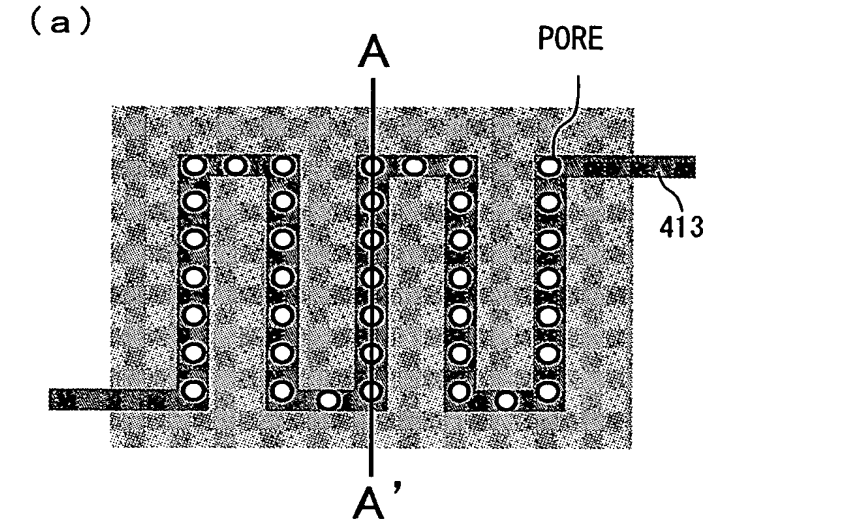


Fig. 8 MEASUREMENT SYSTEM OF ON-WAFER ION ENERGY ANALYZER

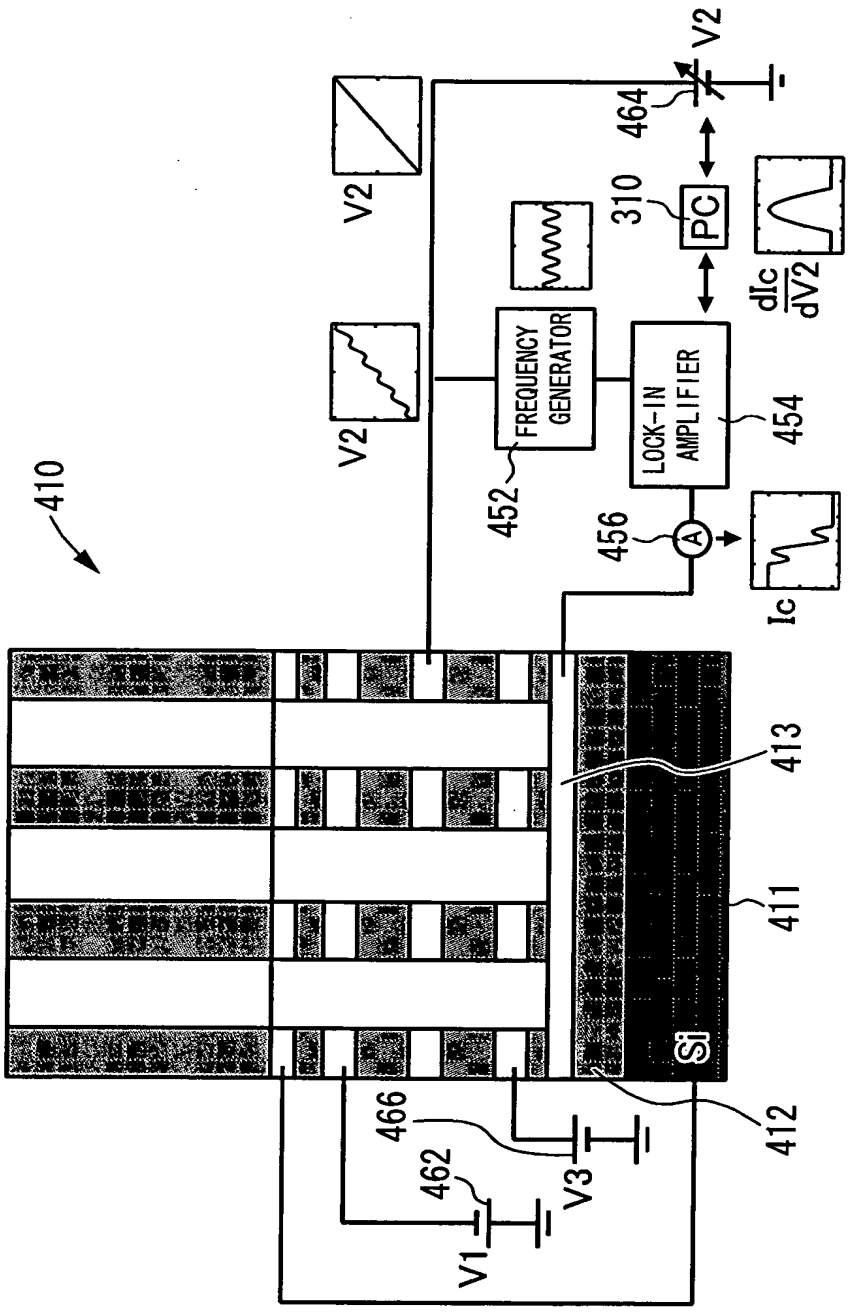


Fig. 9

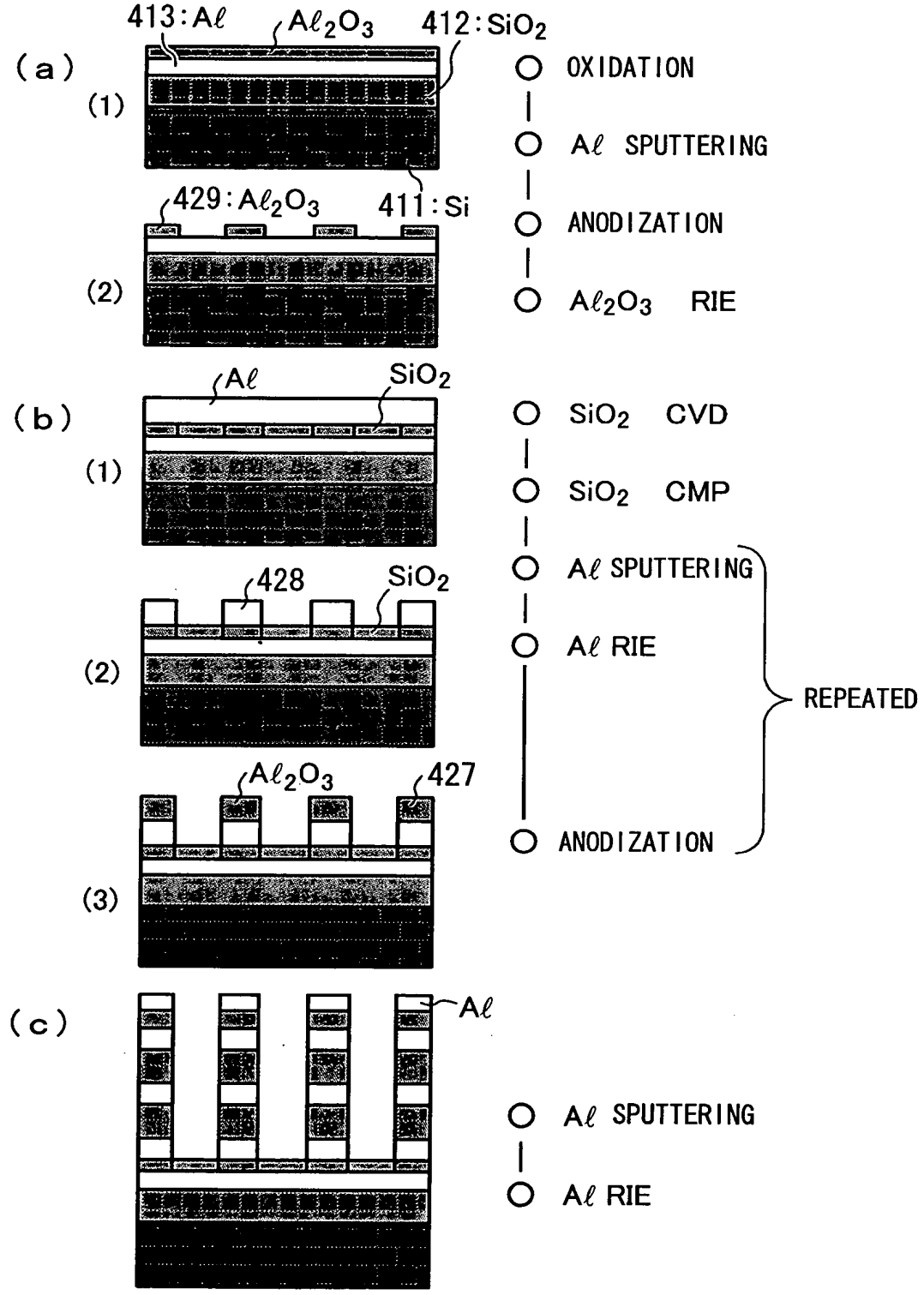

413:Aℓ
Aℓ2O3
412:SiO2
(a)
(1)
OXIDATION
Aℓ SPUTTERING
429:Aℓ2O3
411:Si
ANODIZATION
(2)
Aℓ2O3 RIE
Aℓ
SiO2
(b)
(1)
SiO2 CVD
SiO2 CMP
Aℓ SPUTTERING
428
SiO2
(2)
Aℓ RIE
REPEATED
Aℓ2O3
427
(3)
ANODIZATION
(c)
Aℓ
Aℓ SPUTTERING
Aℓ RIE

Fig. 10

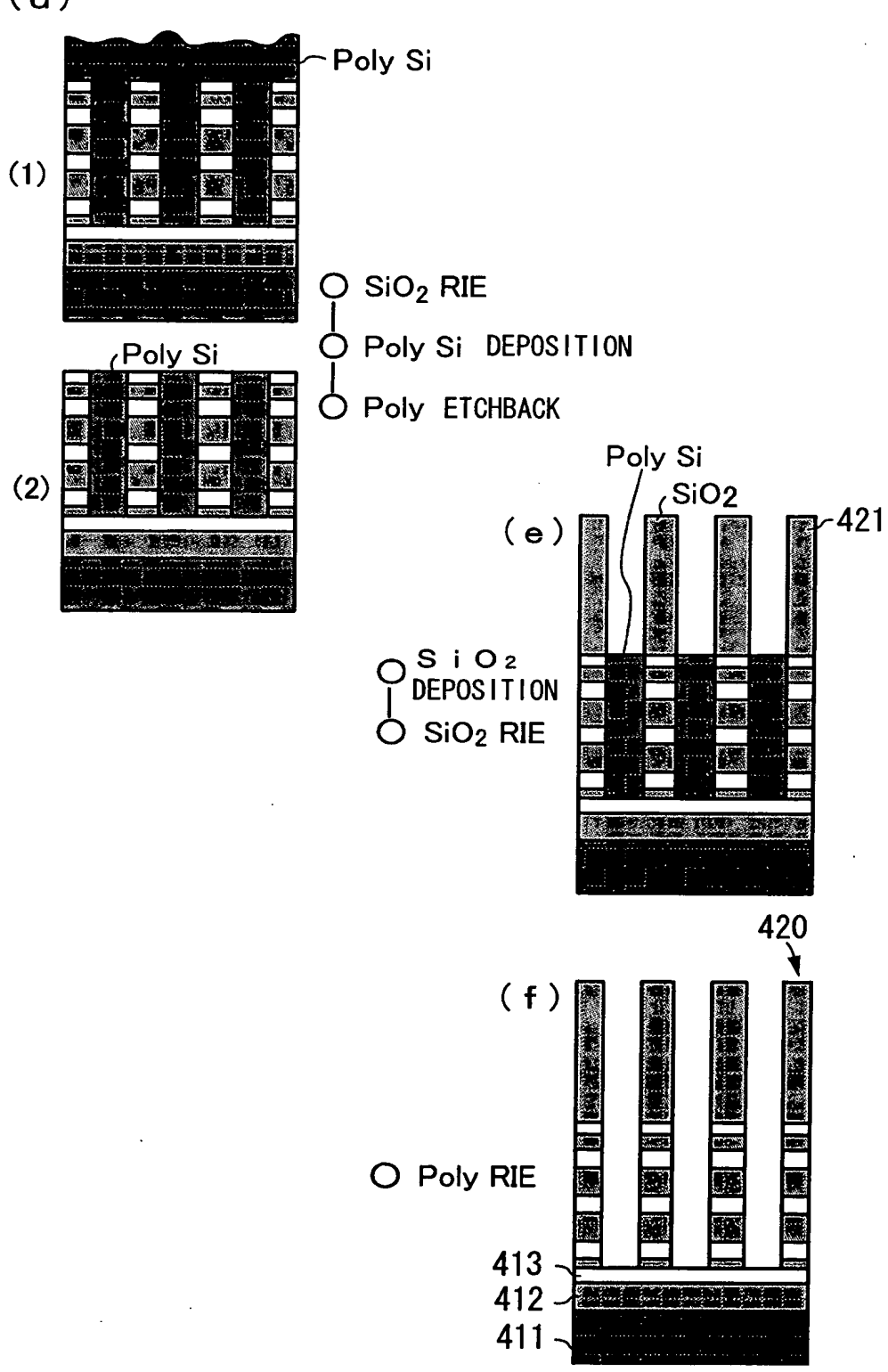

(d)
(1)
Poly Si
SiO2 RIE
Poly Si DEPOSITION
Poly ETCHBACK
(2)
Poly Si
(e)
Poly Si
SiO2
421
SiO2 DEPOSITION
SiO2 RIE
420
(f)
Poly RIE
413
412
411

Fig. 11

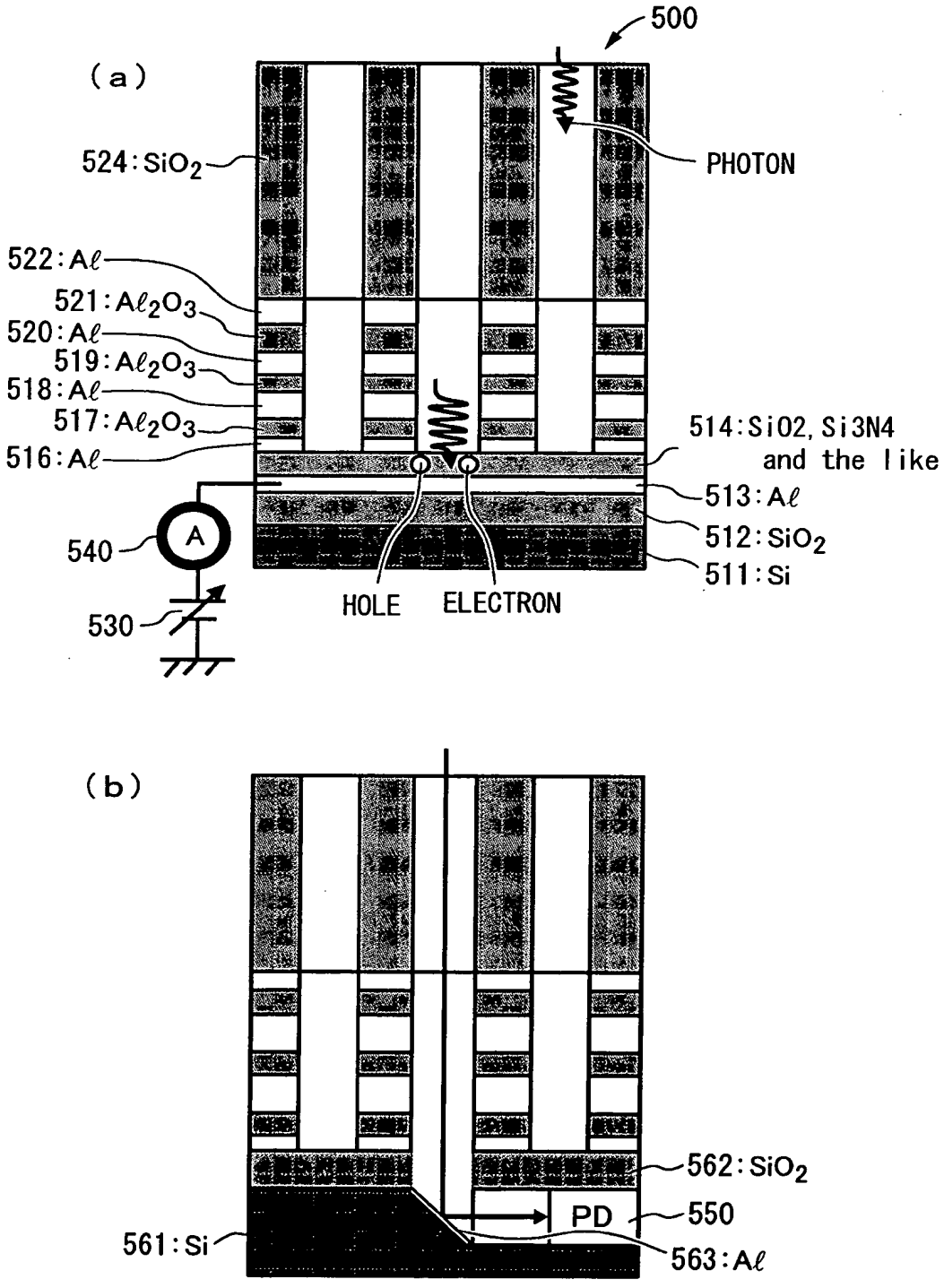

(a)
500
PHOTON
524:SiO2
522:Aℓ
521:Aℓ2O3
520:Aℓ
519:Aℓ2O3
518:Aℓ
517:Aℓ2O3
516:Aℓ
514:SiO2, Si3N4 and the like
513:Aℓ
512:SiO2
511:Si
A
540
530
HOLE
ELECTRON
(b)
562:SiO2
PD
550
561:Si
563:Aℓ

Fig. 12

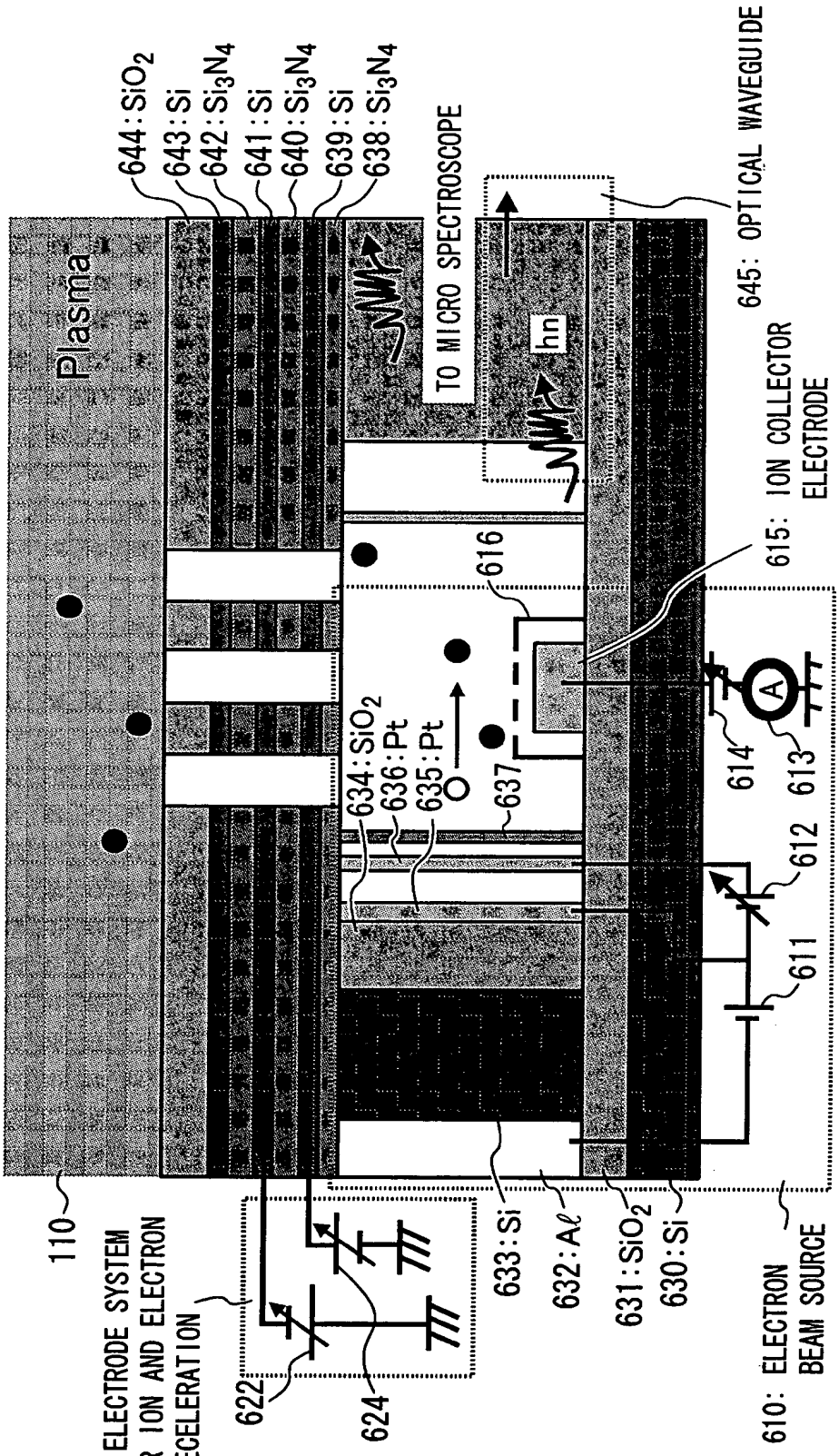

644:SiO2
643:Si
642:Si3N4
641:Si
640:Si3N4
639:Si
638:Si3N4
Plasma
TO MICRO SPECTROSCOPE
645: OPTICAL WAVEGUIDE
hn
615: ION COLLECTOR ELECTRODE
616
634:SiO2
636:Pt
635:Pt
637
614
613
612
611
633:Si
632:Aℓ
631:SiO2
630:Si
110
620:ELECTRODE SYSTEM FOR ION AND ELECTRON DECELERATION
622
624
610: ELECTRON BEAM SOURCE

Fig. 13 FIELD EMISSION TYPE ELECTRON GUN

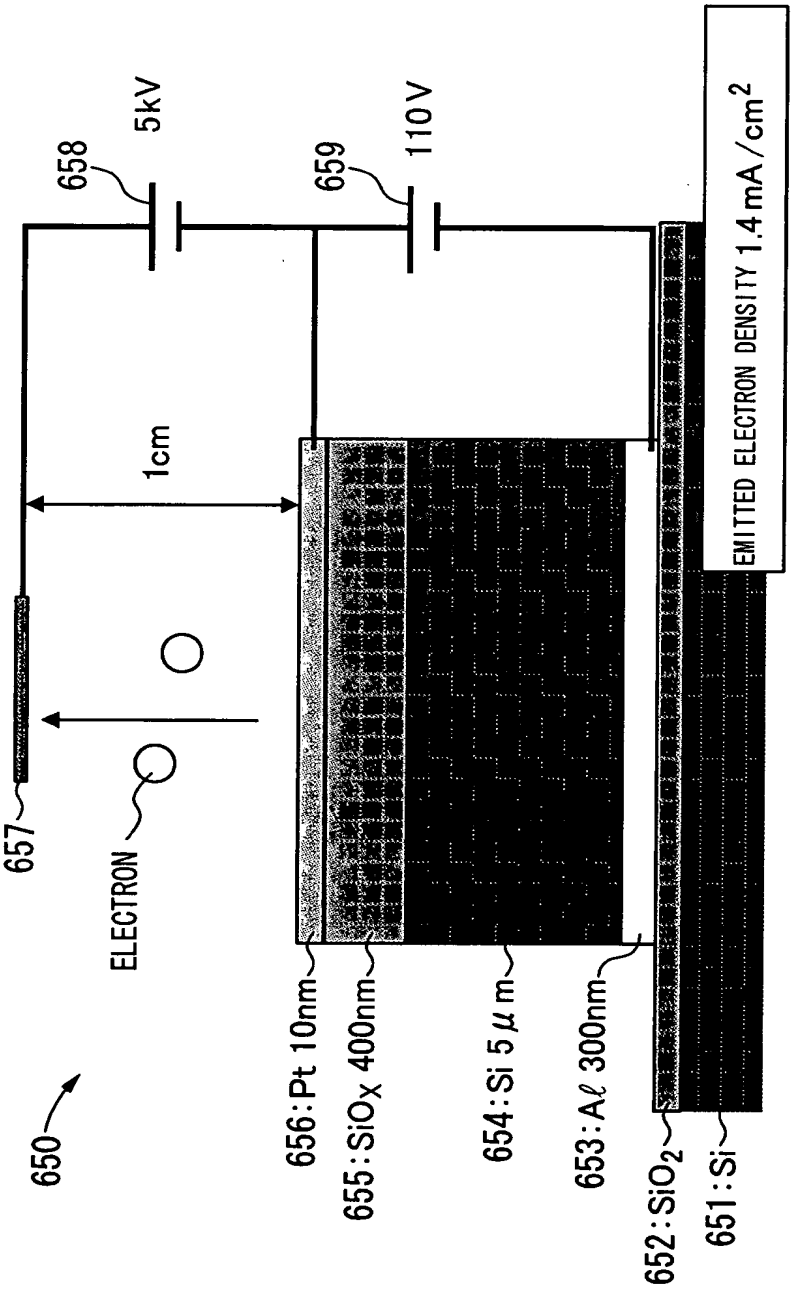
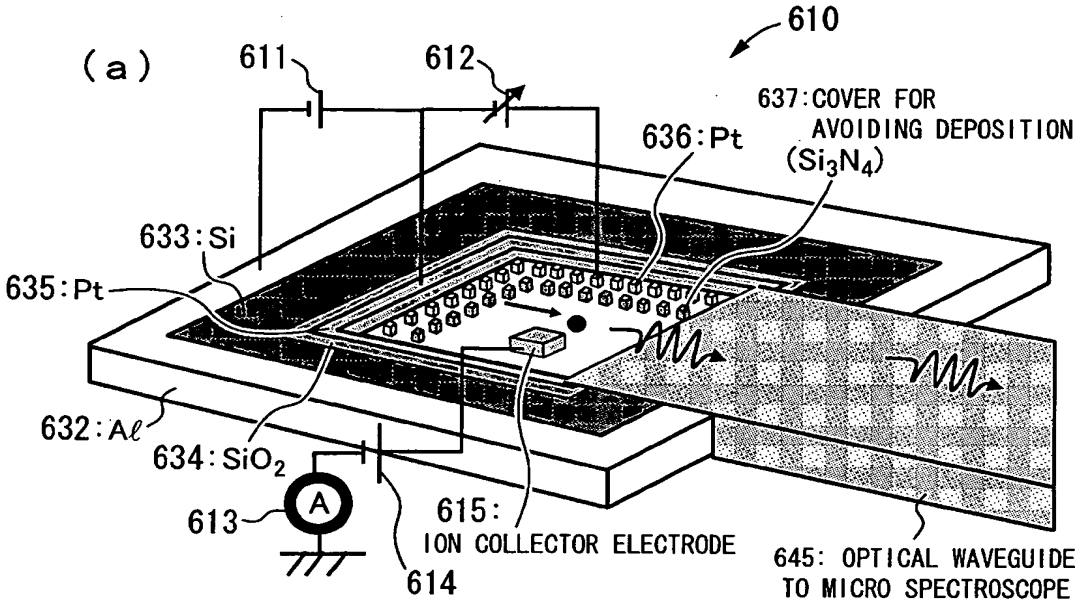


Fig. 14


(a)
610
611
612
637:COVER FOR AVOIDING DEPOSITION
636:Pt
(Si_3N_4)
633:Si
635:Pt
632:Aℓ
634:SiO_2
613
A
615:
ION COLLECTOR ELECTRODE
614
645: OPTICAL WAVEGUIDE TO MICRO SPECTROSCOPE

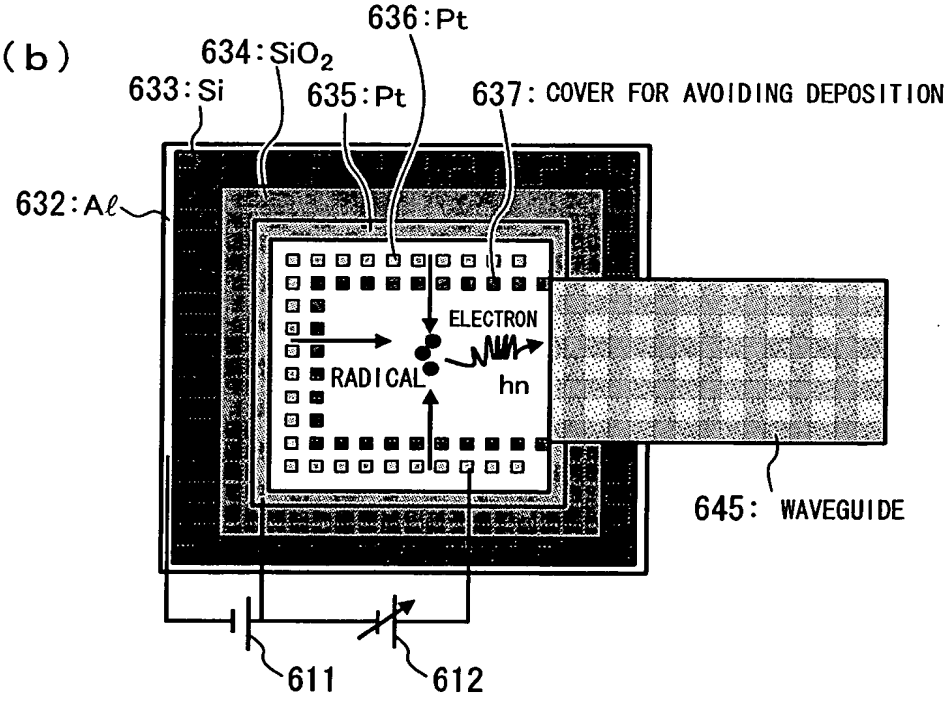

(b)
636:Pt
634:SiO_2
633:Si
635:Pt
637: COVER FOR AVOIDING DEPOSITION
632:Aℓ
ELECTRON
RADICAL
hn
645: WAVEGUIDE
611
612

Fig. 15

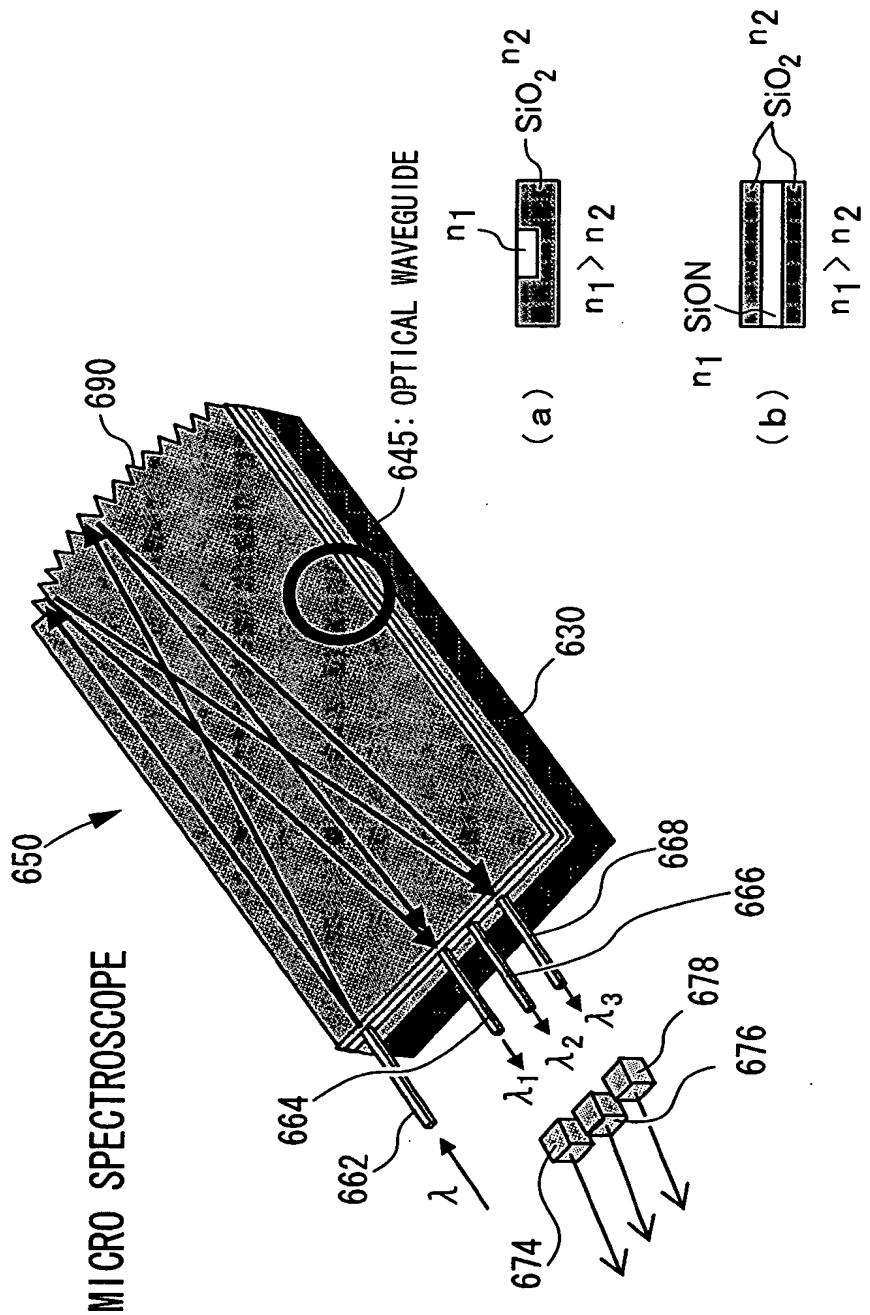

MICRO SPECTROSCOPE
650
690
645: OPTICAL WAVEGUIDE
630
668
666
678
676
664
662
λ
λ1
λ2
λ3
674
(a)
n1
SiO2 n2
n1 > n2
(b)
n1 SiON
SiO2 n2
n1 > n2

Fig. 16

MANUFACTURING PROCESS OF MICRO ION RADICAL ANALYZER(1)

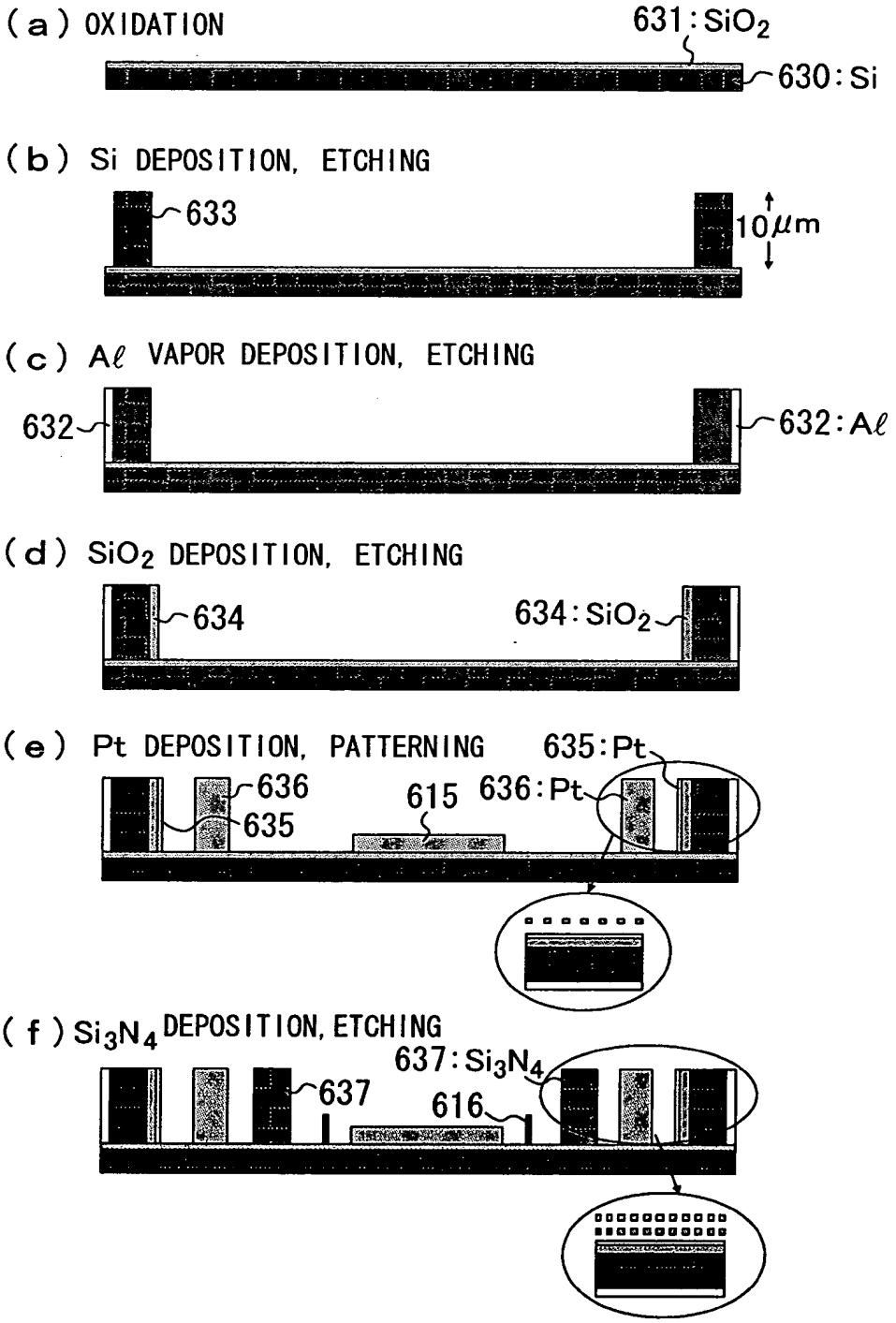


Fig. 17

MANUFACTURING PROCESS OF MICRO ION RADICAL ANALYZER(2)

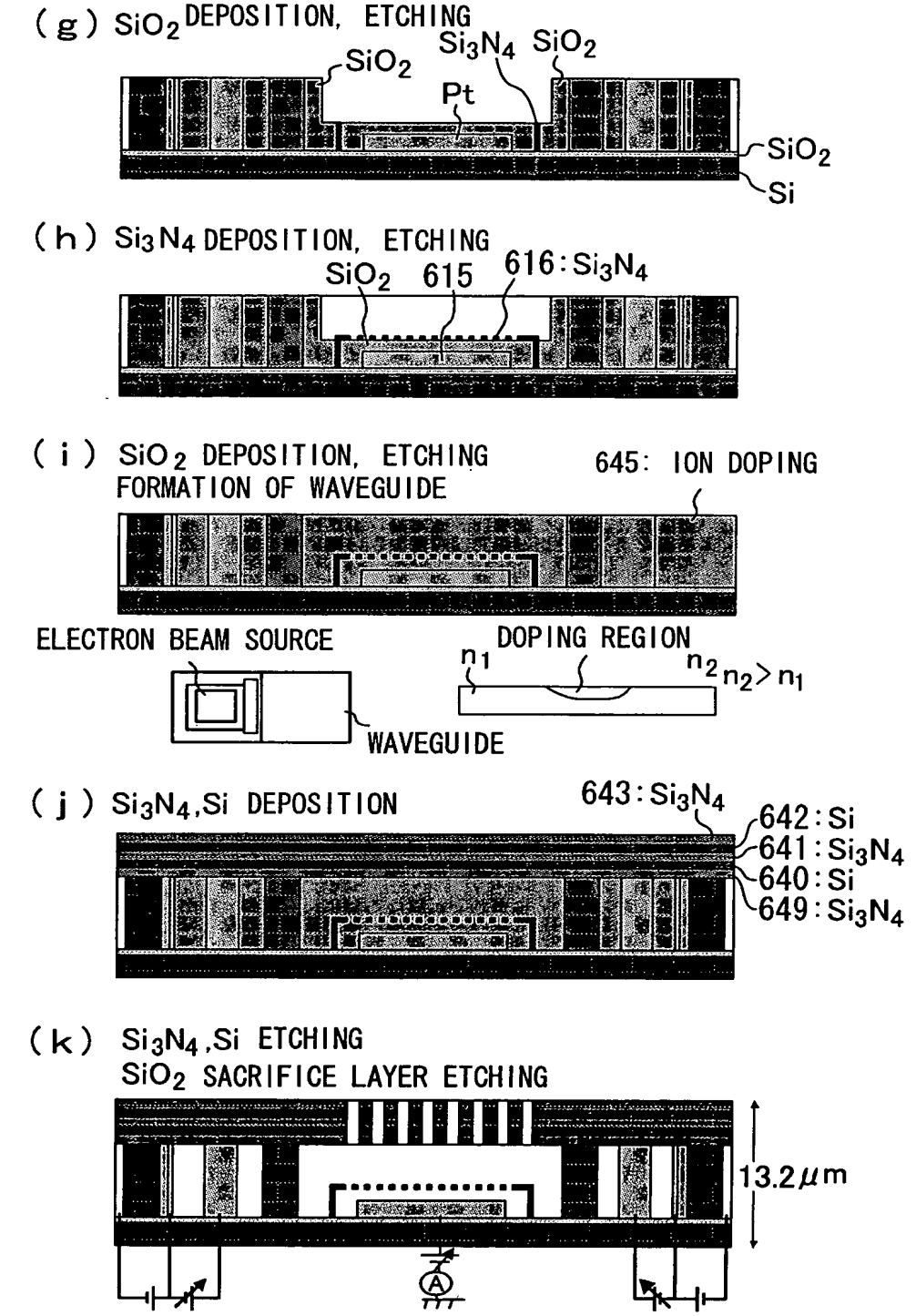


Fig. 18

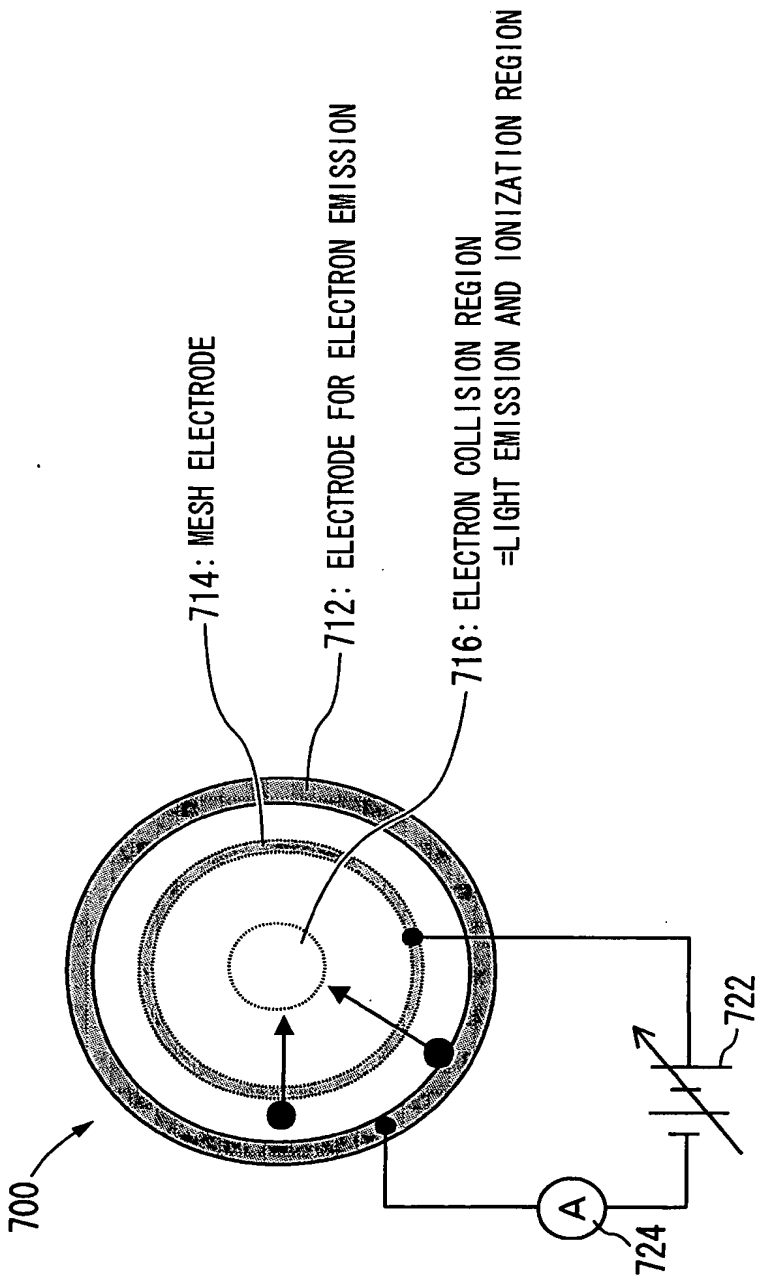

714: MESH ELECTRODE
712: ELECTRODE FOR ELECTRON EMISSION
716: ELECTRON COLLISION REGION
=LIGHT EMISSION AND IONIZATION REGION
700
722
724
A

Fig. 19

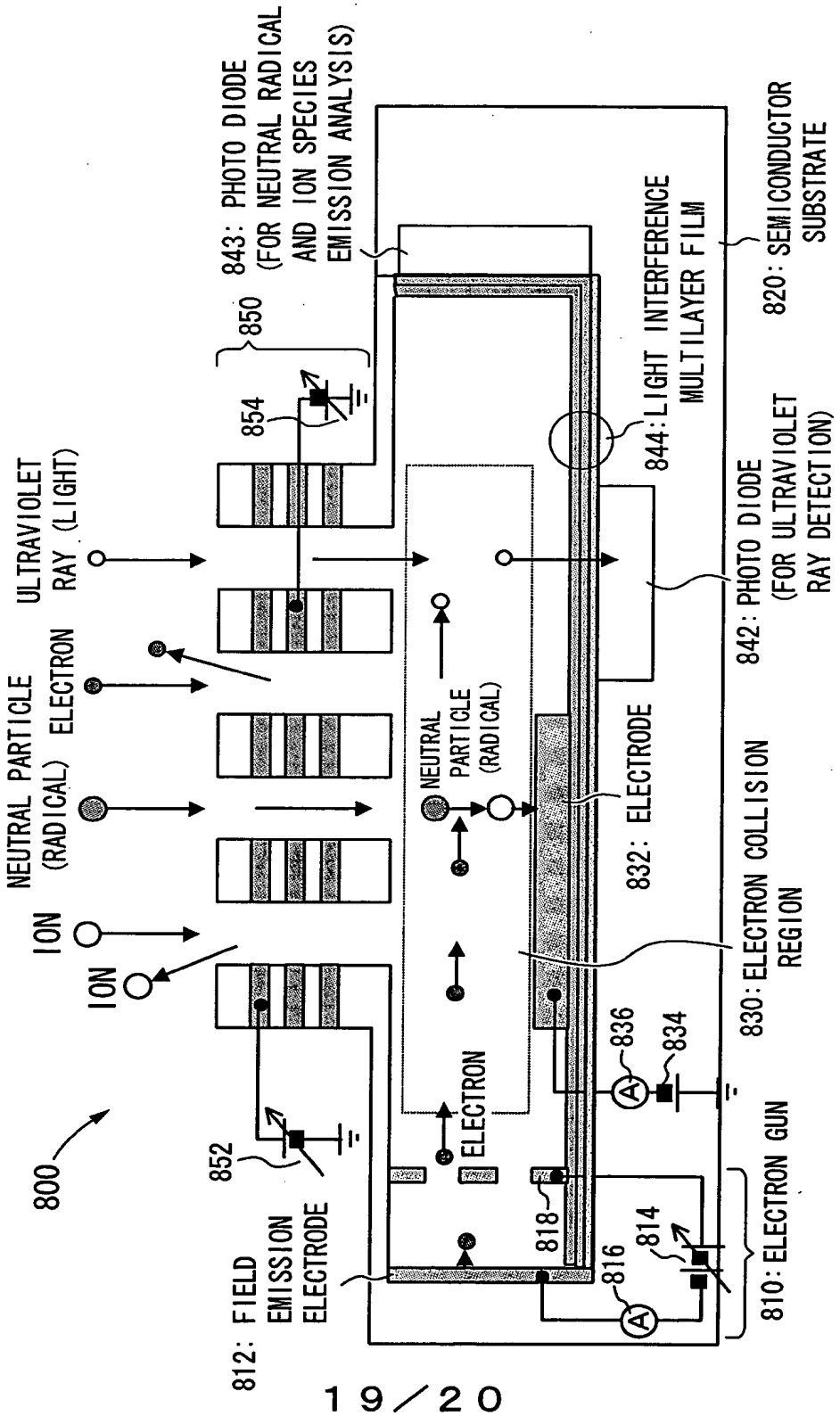
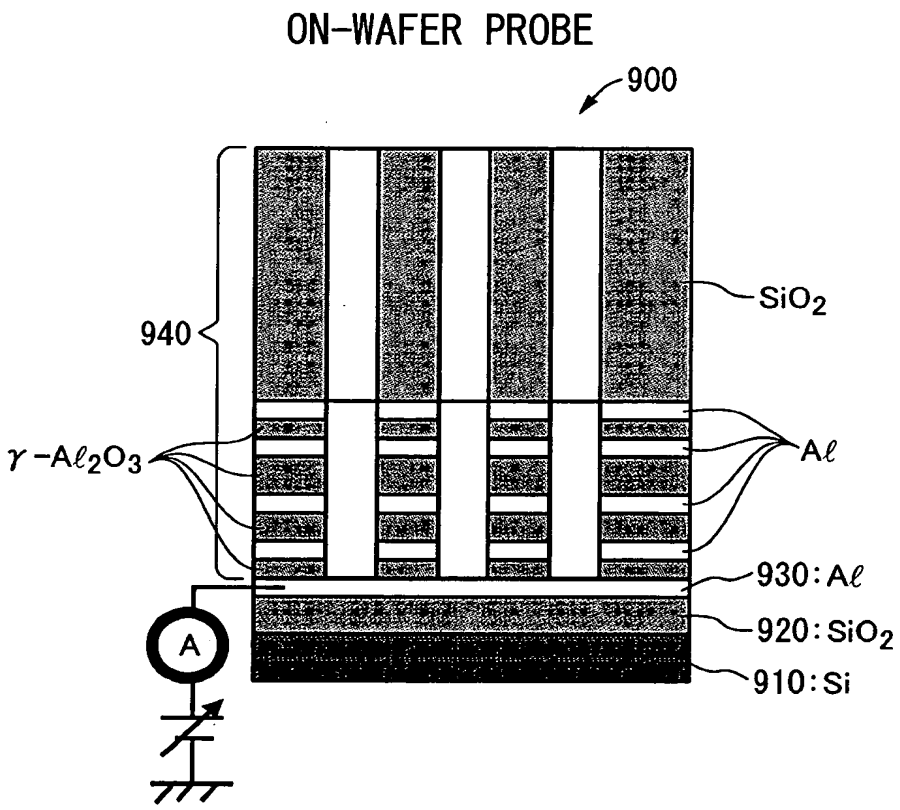

800
ION
ION
NEUTRAL PARTICLE (RADICAL)
ELECTRON
ULTRAVIOLET RAY (LIGHT)
852
812: FIELD EMISSION ELECTRODE
ELECTRON
NEUTRAL PARTICLE (RADICAL)
818
816
814
836
834
830: ELECTRON COLLISION REGION
832: ELECTRODE
842: PHOTO DIODE (FOR ULTRAVIOLET RAY DETECTION)
844: LIGHT INTERFERENCE MULTILAYER FILM
820: SEMICONDUCTOR SUBSTRATE
850
843: PHOTO DIODE (FOR NEUTRAL RADICAL AND ION SPECIES EMISSION ANALYSIS)
854
810: ELECTRON GUN

Fig. 20


ON-WAFER PROBE
900
940
SiO_2
γ-$A\ell_2O_3$
$A\ell$
930: $A\ell$
920: SiO_2
910: Si
A